

# PATENT ABSTRACTS OF JAPAN

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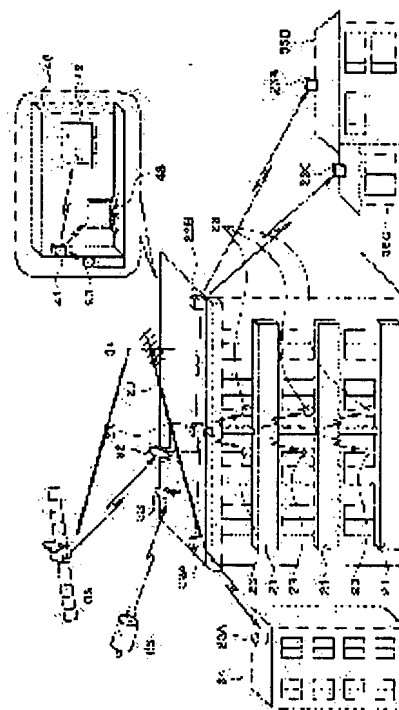
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## (54) WIRELESS TRANSMISSION SYSTEM, RADIO TRANSMISSION METHOD, AND ANTENNA ASSEMBLY

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To enable each home of a collective housing to receive various types of broadcast programs without wiring at a receiver located in each home when each home receiver can receive radio waves emitted from a millimeter wave transmitter installed on a roof, etc. for transmitting various types of broadcast signal including BS broadcast signal.

**SOLUTION:** Antennas 31, 32 and 33 for receiving various sorts of broadcast programs are installed on the roof of the collective housing 20, and signals received at the antennas are supplied to a millimeter wave transmitter 22. Radio waves of a millimeter wave band from the millimeter wave transmitter 22 are received at a millimeter wave receiver 23, and the received signals are received by each home of the collective housing. Each home can view a broadcast program based on a wireless transmission system. Such millimeter waves are transmitted even to an adjacent building 34 and to separate houses 35B and 35C. Thus, a problem that the other



housing or houses can hardly receive the radio waves can be solved. In each home, radio waves from the transmitter 22 are reflected by a reflector or are received by a receiving antenna mounted outside or inside the window pane of the home to wirelessly receive the signals indoors.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention is applied to a millimeter wave band, and relates to a suitable radio-transmission system, the radio-transmission approach, and antenna equipment.

[0002]

[Description of the Prior Art]

In our country, various broadcast media, such as BS digital broadcasting, CS digital broadcast, and CATV, have spread, and spread and development of broadcast media will be increasingly expected with progress of digitization from now on. On the other hand, the factor acting as the failure of the spread of these broadcast media also exists. The complicatedness of wiring is mentioned as a failure in each home. In order to view and listen to two or more broadcast media, the tuner of each broadcast media is needed, and indoor wiring becomes complicated.

[0003]

As a means to solve the problem of this domestic wiring, the millimeter wave image multiplex transmission system is proposed. A millimeter wave band (30-300GHz, electric wave with a wavelength of 1-10mm) can transmit a broadband signal like a video signal with small communication equipment. Especially a 60GHz band is the band of license needlessness, and an electric wave does not reach to a long distance, but it fits the radio-transmission system limited to small area with a radius of about about tenm from the property that interference cannot take place easily. That is, the radio transmission of the broadband signal which multiplexed the video signal of each broadcast media is possible, and since an electric wave penetrates glass, a shoji, a wall, etc., it is possible to install a receiving set also in the next room, and the closed wireless service which does not produce interference in an outdoor alien system is attained with the property in which propagation attenuation is still larger.

[0004]

The television image transmission system as shown in drawing 1 using such a description is proposed. In drawing 1, the antenna for receiving various kinds of television broadcasting is installed in the home. That is, the antenna 1 for reception of terrestrial broadcasting, the antenna 2 for CS broadcasting reception, and the antenna 3 for BS broadcast reception are installed. The input signal of these antennas 1, 2, and 3 is supplied to the millimeter wave transmitter 4 currently installed in domestic.

[0005]

Moreover, the antenna 5 for FWA (Fixed Wireless Access: fixed wireless access) is also installed. An antenna 5 is for wireless LAN (Wireless Local Area Network), and the communication link of the wireless LAN method of the 2.4GHz band of conformity, the wireless LAN method of 5GHz \*\*\*\* of IEEE802.11a conformity, the wireless LAN method of a 25GHz band, etc. of it is enabled at IEEE802.11b. The base transceiver station 6 is connected to this antenna 5.

[0006]

The television receiver 8 connected with STB (Set-top Box)7 and STB7 is installed in domestic. A

television receiver 8 is made possible [ receiving service of CATV (cable television) ], and is connected with the Internet network through ADSL (Asymmetric Digital Subscriber Line).

[0007]

In the system of drawing 1 , when flat TV JON receiving set 9 grade receives the millimeter wave, for example, the electric wave of a 60GHz band, transmitted from the millimeter wave transmitter 4, it becomes possible to view and listen to various kinds of television broadcasting. Moreover, in order to expand indoor receiving area, the relay aircraft 10 is formed if needed.

[0008]

It can view and listen to various kinds of television broadcasting, without connecting between an antenna and a tuner with feeder wire by re-transmitting indoors the television broadcasting signal received with the outdoor antennas 1, 2, and 3 using the electric wave of a 60GHz band, as mentioned above, and the degree of freedom of the installation of a television receiver also improves.

[0009]

[Problem(s) to be Solved by the Invention]

The system shown in drawing 1 was not what offers an indoor radio-transmission system and can solve the trouble of television viewing and listening in an apartment. That is, in an apartment, there is the present condition that wiring of BS-IF is not made and that service of satellite broadcasting services, such as BS broadcast, cannot yet be received for the reason of the building where there is no veranda in southwest and installation of an antenna intercepts difficulty and the direction of southwest existing. Moreover, in an apartment, even if he wants to draw wire broadcasting, such as CATV, in order to start costs, such as a wiring construction cost to each household, there is also the present condition which cannot be drawn.

[0010]

Therefore, the purpose of this invention is to offer the radio-transmission system, the radio-transmission approach, and antenna equipment which can solve the problem about television viewing and listening in the building which is in two or more tenants, such as an apartment and a building.

[0011]

[Means for Solving the Problem]

In order to solve the technical problem mentioned above, invention of claim 1 is a radio-transmission system characterized by installing a millimeter wave transmitter in the roof of a building, or the upper story, emitting the signal of broadcast media caudad as a millimeter wave electrification wave with a millimeter wave transmitter, and transmitting a millimeter wave electrification wave to the tenant of a building by wireless.

[0012]

In one mode of this invention, in order to turn to each tenant's room the travelling direction of the electric wave emitted from the millimeter wave transmitter, a reflecting plate is used. A difference of the receiving level which chooses the reflection factor of a reflecting plate and is produced in a difference of the distance of Hazama of a millimeter wave transmitter and each of two or more reflecting plates is amended. A difference of receiving level is amended by choosing the installation location of a reflecting plate.

[0013]

In other modes of this invention, to each tenant, a receiving antenna is formed and it is made as [ receive / the electric wave from a millimeter wave transmitter ]. A receiving antenna is attached in an indoor [ of the plate with which it divides the outdoors and indoor ], or outdoors side. The millimeter wave signal received with the receiving antenna is indoors reradiated by the transmitting antenna. A difference of the receiving level produced by difference of the distance of Hazama of a millimeter wave transmitter and each of two or more receiving antennas by selecting the installation location of a receiving antenna or selecting the quality of the material of covering of a receiving antenna is amended.

[0014]

Furthermore, this invention is antenna equipment which a millimeter wave electrification wave is received outdoors, and the edge of a receiving antenna is put on the whole surface of the plate with

which indoor and the outdoors are divided in the antenna equipment which reradiates an input signal indoors, and put the edge of a transmitting antenna on the location which are other fields of a plate and is mostly in agreement with the edge of a receiving antenna.

[0015]

This invention is antenna equipment by which the millimeter wave electrification wave was received outdoors, the core wire penetrated the plate with which indoor and the outdoors are divided in the antenna equipment which reradiates an input signal indoors, two coaxial connectors were projected from the both sides of a plate, respectively, and the receiving antenna and the transmitting antenna were connected with the core wire through two coaxial connectors more nearly further.

[0016]

By this invention, a millimeter wave transmitter can be installed in the roof of buildings, such as an apartment, or the upper story, the broadcast signal received with the common antenna can be changed into the signal of a millimeter wave band, and can be emitted, and broadcast media can be transmitted to each tenant on radio by receiving by the receive section which installed in each tenant.

[0017]

[Embodiment of the Invention]

Hereafter, 1 operation gestalt of this invention is explained. The radio-transmission system for solving the trouble on viewing and listening in the building which is in two or more tenants, such as an apartment, offered by this invention will be called vertical system wired system. Vertical system wired system is a system which makes wireless connection of between the roof of a building, or the upper story and each tenant in a lengthwise direction using the electric wave of a millimeter wave, and transmits various multimedia signals including satellite broadcasting service to each tenant. Since vertical system wired system does not newly need to lay wiring of an optical fiber, a coaxial cable, etc. within an apartment, it has the description which can realize a low cost connection service.

[0018]

Drawing 2 shows an example of the vertical system wired system to which this invention was applied, a reference mark 20 is the apartment of 3 stories, for example, the stairway tooth space is provided for the mid gear of a building. A total of every one-house six residences is prepared in the both sides of a mid gear, respectively. The veranda 21 is formed to each tenant.

[0019]

The millimeter wave transmitter 22 is installed near the center of the roof of an apartment 20. For example, the millimeter wave of a 60GHz band is used. The common antenna for television broadcasting reception is installed in the roof, and the output of an antenna is supplied to the millimeter wave transmitter 22. The millimeter wave transmitter 22 is equipped with the up converter which carries out the rise convert of the television signal received with the television antenna to the millimeter wave signal of a 60GHz band, and a transmitting antenna, and emits mostly the signal which carried out the rise convert to a perpendicular lower part with a transmitting antenna. On the other hand, a receive section 23 is established in each tenant, and the output signal of a receive section 23 is drawn in indoor [ of each tenant ].

[0020]

The vertical system wired system mentioned above can receive a broadcast wave at each home by installing the millimeter wave transmitter 22 in the roof of an apartment, and establishing a receive section 23 in each tenant further. This vertical system wired system can perform newly laying wiring of an optical fiber, a coaxial cable, etc. within an apartment as it is unnecessary, and it can realize the connection service of low cost. Moreover, since transmission of the signal of a broadband is possible for the electric wave of a millimeter wave band, it also becomes possible to introduce CATV and the Internet circuit to each home, and transmission of a multimedia signal of it is attained.

[0021]

Drawing 3 shows the example of the structure of a system which extended vertical system wired system more. The antenna 31 for reception of terrestrial broadcasting, the antenna 32 for CS broadcasting reception, and the antenna 33 for BS broadcast reception are installed in the roof of an apartment 20.

The input signal of these antennas 31, 32, and 33 is supplied to the millimeter wave transmitter 22. The electric wave of the millimeter wave band from the millimeter wave transmitter 22 is received in the millimeter wave receive section 23, and an input signal is incorporated to indoor [ of each tenant ].

[0022]

A reference mark 40 shows each tenant. The electric wave of a millimeter wave band is incorporated through a receive section 23 indoor [ of a tenant 40 ]. The millimeter wave transmitter 41 which reradiates indoors the millimeter wave electrification wave received in the receive section 23 is installed in indoor [ of a tenant 40 ]. The millimeter wave electrification wave from a transmitter 41 is received by the flat TV JON receiving set 42 and the receiver added to the liquid crystal television receiver 43 grade. By it, a tenant 40 can receive television broadcasting, such as terrestrial broadcasting, CS broadcasting, BS broadcast, and CATV, and access of him to the Internet is attained.

[0023]

Furthermore, other millimeter wave transmitters 22A and 22B are installed in the roof of an apartment 20. Transmitter 22A transmits a millimeter wave electrification wave to millimeter wave receive section 23A currently installed in the roof of other buildings (an apartment, building, etc.) 34 which adjoined the apartment 20. It can view and listen to various kinds of television broadcasting, and the Internet can be accessed like an apartment 20 in other buildings 34 by the inside-of-a-house radio-transmission system which used the electric wave of the millimeter wave band currently installed in the building. In addition, in this invention, the signal received to each device not only with the radio-transmission system of a millimeter wave band but with the wireless or the cable laid may be transmitted indoor [ of each tenant ].

[0024]

The electric wave emitted from other millimeter wave transmitting section 23B installed in the roof of an apartment 20 is received by millimeter wave receive section 23C currently installed in the roof of single-family house 35C by millimeter wave receiver 23B currently installed in the roof of single-family house 35B, and the list. It can view and listen to various kinds of television broadcasting, or can access to the Internet through the millimeter wave band radio-transmission system currently installed in each domestic one. Thus, it becomes possible to receive satellite broadcasting service also in the building which can share antennas 31, 32, and 33 by the tenant of two or more buildings, and cannot receive satellite broadcasting service with a location top or the newly made building.

[0025]

In the vertical system wired system mentioned above, some examples of a configuration for each tenant to receive the electric wave of the millimeter wave band emitted from the transmitter 22 currently installed in the roof are explained. The example shown in drawing 4 is an example for which a receive section 23 has a reflector 51. A number equal to the number of houses of reflectors 51 are installed. It expands in drawing 4, and a reflector 51 supports the metaled reflecting plate 52 and a reflecting plate 52, and consists of the anchoring section 53 for attaching in veranda 21 grade so that it may be shown.

[0026]

A travelling direction is mostly bent by the right angle with a reflector 51, and the electric wave of the millimeter wave band caudad emitted from the transmitter 22 installed in the roof of an apartment 20 is emitted towards every house. The outdoors and indoor are usually divided with the apartment 20 with the glass window in many cases. Glass can be passed as the electric wave of a millimeter wave band is even for comparatively little about 2dB transmission loss. Therefore, a signal can be transmitted to indoor, without decreasing almost. Indoors, indoors a radio-transmission system which was mentioned above is installed, an indoor receiving antenna receives the electric wave reflected with the reflector 51 in it, and it reradiates with a transmitting antenna.

[0027]

In vertical system wired system, since a transmitter 22 is installed in the roof or a highest floor, in the more nearly upper story, receiving level becomes high. Since receiving level is excessive, the problem of a signal being saturated arises. On a lower story, since receiving level is too small, a noise increases. Therefore, it is made as [ amend / the variation in the receiving level relevant to the distance of Hazama

of such the millimeter wave transmitter 22 and a receive section 23 ].

[0028]

The reflection factor of a reflecting plate 52 has the variation in receiving level amended in the example which uses the reflector 51 shown in drawing 4 . A reflection factor is different with the class of metallic material which constitutes a reflecting plate 52. For example, as compared with a stainless plate, the reflection factor of an aluminum plate is high. The reflector 51 with which a reflection factor consists of a low metal is installed in the upper story, and the reflector 51 with which a reflection factor consists of a high metal on the other hand is installed in a lower story. Moreover, in order to lower a reflection factor, an acid-resisting film may be stuck.

[0029]

The electric wave reflected with the millimeter wave transmitter 22 or the reflector 51 is received by the receiving antenna so that it may mention later. Usually, the receiving antenna is equipped with wrap covering in the antenna. This covering is made from synthetic resin. The thickness of covering can be changed, or a wave absorber can be stuck to covering, and a reflection factor can be changed. Two or more approaches of amending a difference of the receiving level mentioned above may be combined.

[0030]

Moreover, in the case where what has directivity as shown in drawing 5 as an antenna of the millimeter wave transmitter 22 is used, it is made as [ install / in the location where the reflector 51 of the upper story shifted a little than just under an antenna / the reflector 51 of a lower story is installed by the relation located just under an antenna, and ]. It can amend the variation in the receiving level by difference of the antenna of a transmitter 22 and the distance of a reflector 51.

[0031]

Next, the configuration which uses a receiving antenna as a receive section 23 is explained.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is an approximate line Fig. for explaining the domestic television image radio-transmission system proposed previously.

[Drawing 2] It is the approximate line Fig. showing 1 operation gestalt of the radio-transmission system by this invention.

[Drawing 3] It is the approximate line Fig. showing the example of a configuration which the radio-transmission system by this invention extended.

[Drawing 4] In the radio-transmission system by this invention, it is the approximate line Fig. showing an example of a configuration of drawing the signal from a millimeter wave transmitter in indoor [ of each subscriber ].

[Drawing 5] It is the approximate line Fig. showing a directive example of the electric wave from a millimeter wave transmitter.

[Drawing 6] In the radio-transmission system by this invention, it is the block diagram showing other examples of a configuration of drawing the signal from a millimeter wave transmitter in indoor [ of each subscriber ].

[Drawing 7] In the radio-transmission system by this invention, it is the block diagram showing the example of further others of a configuration of drawing the signal from a millimeter wave transmitter in indoor [ of each subscriber ].

[Drawing 8] It is the approximate line Fig. showing an example of antenna equipment which realizes the configuration of drawing 7 .

[Drawing 9] It is an approximate line Fig. for explaining how to suppress the unnecessary reflection by the connection of the antenna equipment shown in drawing 8 .

[Drawing 10] In the radio-transmission system by this invention, it is an approximate line Fig. for explaining the connector for drawing the signal from a millimeter wave transmitter in indoor [ of each subscriber ].

[Drawing 11] It is the approximate line Fig. showing other operation gestalten of the radio-transmission system by this invention.

[Description of Notations]

20 [ ... A reflector, 52 / ... 61 A reflecting plate, 71 / ... 62 Glass, 66 / ... A receiving antenna, 63 / ... Amplifier, 64 / ... A transmitting antenna, 70 / ... Connector ] ... An apartment, 22, 22A, 22B ... A millimeter wave transmitter, 23, 23A, 23B, 23C ... A receive section, 51

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[Translation done.]



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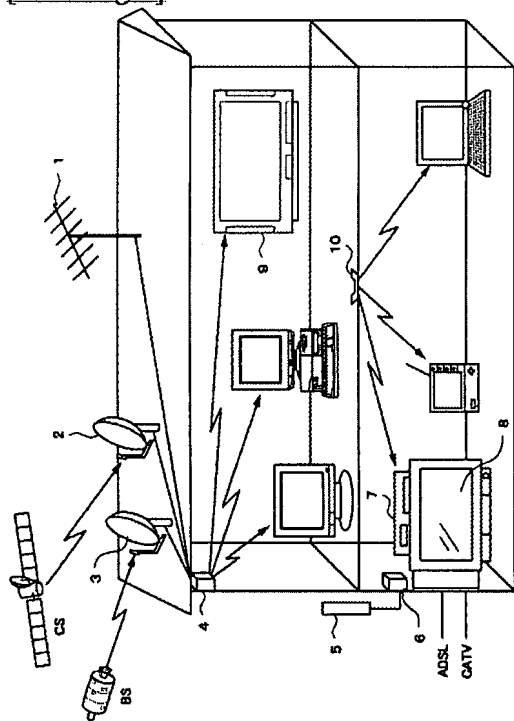
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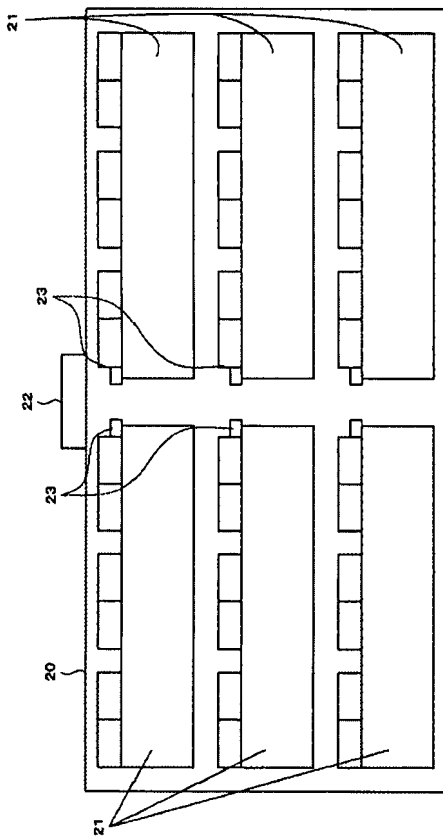
DRAWINGS

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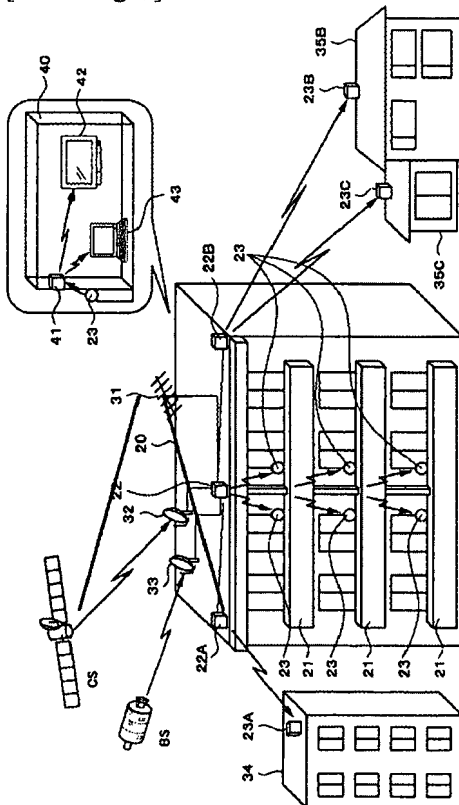
[Drawing 1]



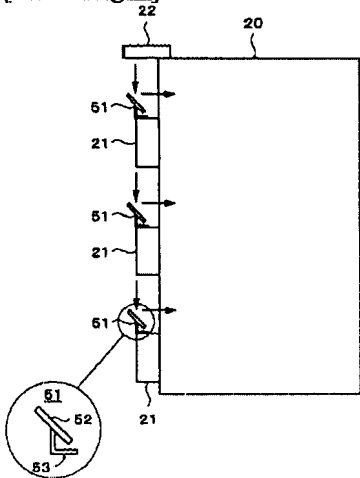
[Drawing 2]



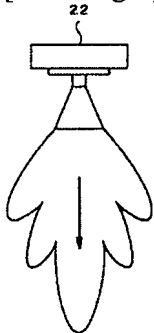
[Drawing 3]



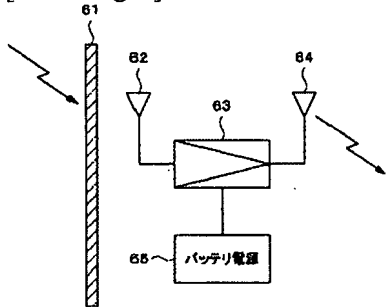
[Drawing 4]



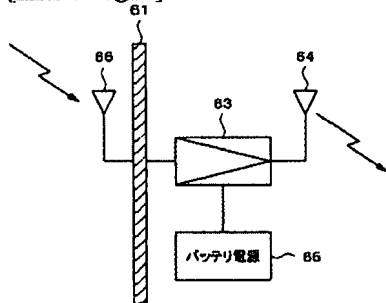
[Drawing 5]



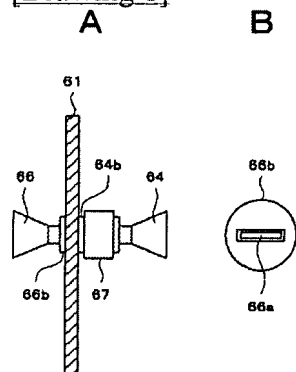
[Drawing 6]



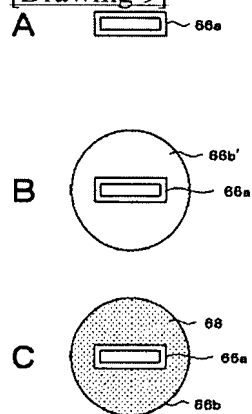
[Drawing 7]



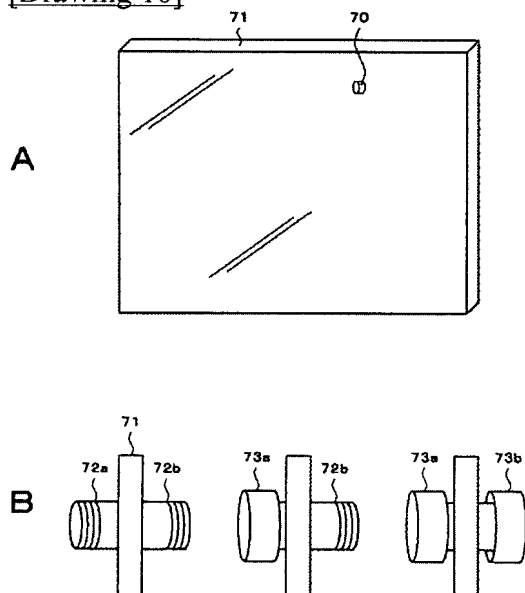
[Drawing 8]



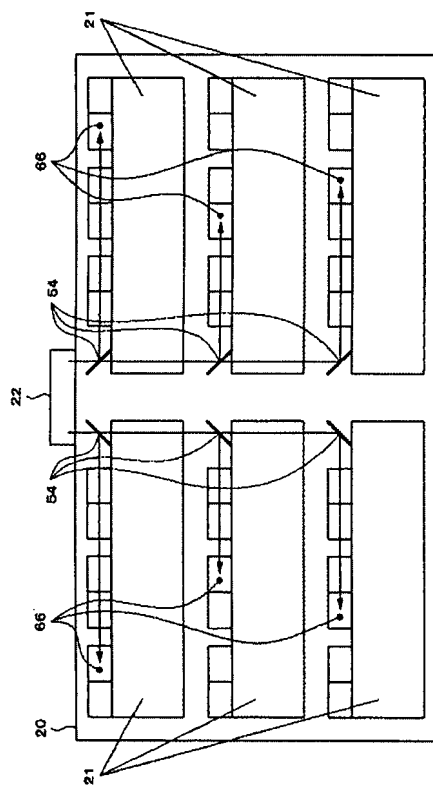
[Drawing 9]



[Drawing 10]



[Drawing 11]



[Translation done.]